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BACKGROUND

The invention generally relates to communication devices. In particular, the invention relates to portable communication devices.

Communication devices are increasing in popularity, such as portable cassette players and portable radios. A typical portable radio has an antenna for receiving radio frequency signals and an adjustable tuner which can be set to receive a radio frequency of a desired radio station transmission. The received signal of the radio station is sent to a speaker and audio signals are produced by the speaker for use by the listener. An individual using such a radio, typically, tunes the radio to the frequency of a desired radio station. As a result, the individual receives signals from the desired radio station.

As the size of tuners and other radio components is decreasing in both size and cost, both the size and cost of radios as well as other portable communication devices is decreasing. Accordingly, it is desirable to have alternate uses for such devices.

SUMMARY

A portable communication device associated with a predetermined broadcast has a receiver and a speaker. The receiver receives the predetermined broadcast. The receiver is preset to receive the predetermined broadcast. The speaker produces audio signals of the received predetermined broadcast.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a flow chart of associating a portable communication device with a broadcast.

Figure 2 is a flow chart of associating a portable communication device with a broadcast using a timelock.

Figures 3A-3C are illustrations of a portable radio configured to fit around an ear.

Figure 3D is a sideview of the speaker of the radio of Figure 3C.

Figures 4A-4C are illustrations of the portable radio of Figures 3A-3B being worn by an individual.

Figure 5 is a diagram of radio components.

Figure 6 is a diagram of radio components including a burst transmitter.

Figure 7 is an illustration of a distributed communication network.

Figure 8 is an illustration of a distributed communication network using a single frequency.

Figure 9 is a diagram of radio components including a microphone and transmitter.

Figure 10 is an illustration of a portable radio with a microphone.

Figure 11 is an illustration of an automated distributed communication network.

Figures 12A and 12B are illustrations of a portable "digital recording" player configured to fit around an ear.

Figure 13 is a diagram of components of a "digital recording" player.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

Figure 1 is a flow chart illustrating associating a portable communication device, such as a portable radio, portable television, personal digital assistant (PDA) or cellular phone, with a predetermined broadcast. When the communication device is a portable radio, the predetermined broadcast may be a radio station broadcast or a radio show broadcast. When the communication device is a portable television, the predetermined broadcast may be a television station broadcast or a television show broadcast. The predetermined broadcast may also be sent in a digital format, such as digital radio, digital cable or the Internet. The predetermined broadcast may be a one time or infrequent event, such as a sporting event or

a concert. The predetermined broadcast may also be a periodic event, such as a daily radio show or a weekly television show.

The portable communication device is set to receive the predetermined broadcast, step 10. When the communication device is a radio, the radio is set to the radio frequency of the broadcast. When the broadcast is a television station or show, the communication device is set to the frequency of the television broadcast. When the communication device is used to receive digital signals, such as a PDA device or digital cellular phone, the communication device is preset to decode that broadcast. In addition to decoding, the communication device may also require setting the device to a predetermined frequency and decrypting data, based on the digital media.

After the portable communication devices have been set to receive the broadcast, the communication devices are distributed to individuals, step 12. The distribution may be by selling the devices directly to consumers. To illustrate, radios set to a station broadcasting a football game are sold at the football stadium or at local stores. Additionally, the devices may be distributed by selling them to a broadcaster, who will give them away to promote a broadcast. To illustrate, a radio station desires to promote itself. The radio station may give away portable radios preset to its radio frequency. Additionally, the devices may be sold to a sporting event related entity. The devices may be packaged with tickets to the sporting event, such as golf or football.

As illustrated in Figure 2, for broadcasts having an associated broadcast time period, such as a radio show or a television show, the communication device is set to only work during the time period of broadcast of that show, step 14, such as by use of a timer. Essentially, the communication device is locked, "time locked", to a predetermined operating time. To illustrate, a radio station's morning show is broadcast at 5 a.m. to 11 a.m. on weekdays. The communication device, being a radio, is set to the radio frequency of that radio station and only operates during the hours of 5 to 11 a.m. As a result, only the reception of that radio show can be received on the communication device.

The time lock has other advantages. For portable devices using batteries, limiting the operating period of the communication device extends the life of the battery. The extended life reduces the period between battery replacements or recharges. If the time locked communication devices are sold as disposable units, the extended life increases the time between purchases, reducing the cost to the purchaser, such as a promoter or a broadcast listener.

Figure 3A is one portable radio 16 configured to fit in and around an ear for use in receiving predetermined broadcasts. The radio 16 has a speaker 18, a housing 20, which contains the radio components, and an antenna 22. On the housing 20 is a switch or button 24 for use in turning the radio on and off and controlling the volume. Also as shown, the housing 20 may have an adapter 25 to allow access for setting the radio's frequency. Alternately, if the portable radio 16 is not fixedly set to the predetermined broadcast, the radio 16 may have a knob or button for adjusting the frequency of an adjustable tuner.

When worn by an individual, as shown in Figure 4A, the speaker 18 is configured to fit substantially in the concha portion 28 of the ear 26. The speaker directs sound towards the ear canal 30. A hollow rigid cylinder 34 extends from the speaker upwards towards the front 32 of the helix portion of the ear 26. The cylinder 34 contains conductors to the speaker 18. A semi-flexible C-shaped housing 20 contains the major components of the radio. As shown in Figure 4A, the semi-flexible housing molds to the contour of the top and back of the meeting of the pinna 31 and head. As a result, the radio 16 can be used with individuals with varying ear shape and size. The semi-flexible housing is connected to the rigid member 34. The housing 20 has a narrow portion resting on top of the pinna/head connection. When worn, the narrow portion fits in the gap between the pinna 31 and head. A wider portion follows the back of the pinna/head connection and extends slightly below the ear 26. An antenna 22 projects out of the bottom of the housing for use in receiving radio frequency signals.

Due to this configuration of the radio 16, the radio 16 is held in place even under strenuous listener activity. The radio speaker 18 is biased against the ear concha 28. The narrow portion of the housing 20 is supported by the top of the pinna/head connection and during a shock biases against the pinna 31 and head. The wider portion, which contains most of the radio components and most of the radio's weight, is pulled towards the ground by gravity. The rigid cylinder 34 fixedly attached to the speaker 18 keeps gravity from pulling down the radio 16. Due to the various points of bias and support, the radio can remain in place when worn, even under strenuous activity. The C-shape and wider portion of the housing 20 holds the radio 16 on when the listener experiences an upward jolt. During an upward jolt, the wider portion biases partially against the lower pinna/head connection and the speaker biases against the concha 28. Additionally, as shown in Figures 3B and 4B an elastic band may be used to connect the speaker 18 to the wider portion housing. This extra connection allows the radio 16 to remain in place even when an individual is suspended up-side-down. To allow the radio 16 to be used in either the left or right ear 26, the speaker 18 may be rotatable so that it can direct sounds into the ear canal 30 of either ear 26.

As shown in Figures 3A-3C and 4A-4C, to better associate the radio 16 with the broadcast, indicia 24 of the broadcast is preferably put on the radio 16. For a radio station broadcast, the indicia 24 may be the radio station's associated frequency and symbol. For a sporting event broadcast, the indicia 24 may be a sports team's logo. Additionally, the indicia 24 may be of an advertiser or a sponsor of the event. The indicia 24 is preferably located such that it is visible when in use by the individual as shown in Figures 4A-4C.

Additionally, the speaker 18 can be enlarged to hold broadcast indicia 19 as shown in Figures 3C and 4C. As shown in Figure 3D, one portion 18B of the speaker 18 is configured to fit within that concha 28. A second portion 18A has a larger area for containing the indicia 19. As a result, the area for placing indicia 19 is increased with the speaker substantially fitting within the concha 28.

Figure 5 is an illustration of the circuitry of the radio 16. The antenna 22 receives various radio frequency signals. A tuner 48, which is pretuned to only the frequency of the desired received radio broadcast, is coupled to the antenna 22. The tuner 48 recovers the broadcast signal as a corresponding baseband signal. The baseband signal of the broadcast is amplified by an audio amplifier 40 and sent to the speaker 44. Based on the voltage levels output by the audio amplifier 40, a resistor may be used to adjust the voltage levels. The speaker 44 produces audio signals of the broadcast.

The tuner 48 is powered by a power supply 54, such as a battery. The power supply may also be a rechargeable battery. The supply 54 is coupled to the tuner 48, via a capacitor 52 and either a switch or push button 50. One type of switch or push button would have three states. The three states are an off-state, an on-state with low volume and an on-state with high volume. The low volume state allows a listener to hear things other then the received broadcast, such as conversations or traffic. The high volume state blocks out most external noise allowing the listener to hear primarily the broadcast. The switch/button 50 may have more than two volume states to allow the listener more choices in volume level.

For radios 16 to be distributed widely for a single broadcast, the tuner 48 may be a single frequency tuner. Alternately, a crystal, which will receive signals only at the desired frequency, may be used. A variable tuner may also be used. The variable tuner can be tuned to receive one of many radio frequencies. Preferably, during manufacture, the tuner 48 is set to the frequency of the predetermined broadcast. The tuner 48 is subsequently sealed in the housing 20 of the radio 16. As a result, an individual using the radio 16 will not be able to change the preset frequency.

The variable tuner allows for a single circuit design to be used. The tuner 48 is simply adjusted prior to being sealed in the housing 22. This allows for a single radio design to be used for multiple predetermined broadcasts. One approach to set the frequency, as shown in Figure 5, uses frequency fixing leads 38. The frequency is fixed by inputting an appropriate signal to an adapter 25, such as a female adapter as shown in Figures 3A-3C,

4A-4C, to set the radio's frequency. The variable tuner facilitates mass production of the radios 16 for use with multiple broadcasts. Radios 16 without indicia 19, 23 are mass produced. When an order for radios 16 for a certain broadcast is received, the frequency is set and the indicia 19, 23 is added.

The use of the frequency fixing leads 38 and a rechargeable battery allows the radios 16 to be used for multiple events. After one event, the radios 16 can be reset to a frequency of another event, battery recharged and new indicia 19, 23 put on the radios 16. For instance, the radios 16 may be distributed and collected at a concert one day and reused at a football game another day.

For broadcasts having a predetermined broadcast time period, the time lock aspect may be used. As shown in Figure 5, one approach to providing the time lock is to use a timer 36 and a timer switch 42. The timer 36 is used to determine when the radio should be on or off. The timer switch 42 decouples the supply 54 from the tuner 48 during periods when the radio 16 should not be operational. The period of operation is set during manufacture.

By replacing the tuner with an infrared receiver, infrared signals can be received. Such a system is desirable when a broadcast is only desired to be received in a limited area. One such application is at a place with many points of interest, such as a museum or a scenic outdoor area, where an infrared transmitter would broadcast a description of the points of interest, such as artwork or a landmark, located near the transmitter. The tuner may also be replaced with a receiver capable of receiving other signals in the electromagnetic spectrum, such as light or microwaves.

For use in monitoring radio usage, the radio circuitry as illustrated in Figure 6 may be used. A burst signal transmitter 56 is coupled to the switch/button 50, periodically when the radio is on (in use), the burst signal transmitter 56 produces a burst signal. The burst signal is radiated by the antenna. A radio station may deploy receivers throughout its

operating area to receive the burst communications. As a result, the number of listeners using distributed radios and their location can be determined.

The radio 16 of Figures 3A-3C, 4A-4C and 5 could also be used in a distributed communication network, as shown in Figure 7. A variable frequency transmitter 66 and associated antenna 68, as shown in Figure 5, are capable of sending communications on one of a set of preassigned communication frequencies. One set 58 of the radio units 70-74 is fixed to receive communications at one transmitting frequency of the set. Another set 60 of radio units 76-80 is assigned to another transmission frequency of the set and so on for set 64 and its radios 82-84. As a result, an individual at the transmitter 66 can communicate with a selected group of individuals using the preassigned radio receivers. Using the radio 16 of Figures 3 to 5 in a work environment, the individuals can have both hands free to perform their tasks while receiving instructions from a central manager. The transmitter may transmit a signal containing voice or other sounds, such as music for the employees' enjoyment. Alternately, the transmitter 66 and radio units 70-84 may be configured to use other portions of the electromagnetic spectrum for communication, such as infrared or light. The transmitter 60 and radio units 70-84 may communicate in either an analog or digital format.

To reduce the complexity of both the transmitter and receivers, the network of Figure 8 may be used. The radio only transmits signals over a single fixed frequency. All 88 of the radios 70-84 only receive the radio signals over the single frequency.

One application for such a network is a supermarket or retail environment. An individual would speak into a public address system or network 100. The network 100 is coupled to the transmitter 99 which transmits to the radio units 70-74. As a result, only the employees with radio units 70-74 hear the public address messages, not the customers.

Figure 9 illustrates radio circuitry for use in a distributed network which allows for uplink communications. The microphone 92 would extend out of the bottom of the radio, as shown in Figure 10, and would be configured to receive the voice signals out of the

listeners mouth. A semi-rigid support 96 is used to connect the microphone 92 to the radio and support it in front of the listener's mouth. The semi-rigidness allows the microphone position to be adjusted for differing individuals. A transmitter 90 which is coupled to the antenna 22 converts the voice signal into a radio frequency signal. The antenna 22 radiates the radio frequency signal for reception at the central manager's antenna 68. A receiver is coupled to the manager's antenna 68 to receive the transmitted signal. The uplink signal may be sent over the same frequency that the radio is set to receive signals over in a half duplex mode. Alternately, the uplink signals may be sent over a different frequency so that full duplex communication may be used.

Figure 11 illustrates an automated distributed network. A central network 100 determines an order to be given. The central network 100 may be a single computer or a company's network. Middleware 98 converts the order into a voice signal, such as by using voice synthesizing software. A transmitter 99 transmits signals to the radio units 70-74. If the distributed network uses radio units set to different frequencies, the middleware indicates which individuals should receive the order. The middleware sets the transmitter 99 to the appropriate frequency.

One application for such a network is in a warehousing environment. Orders are received by the central network 100. The central network 100 via the middleware sends the orders by voice commands to the appropriate warehouse employee. The distributed network is compatible with existing central networks. The commands which would traditionally be sent to an individual are sent to the middleware 98. As a result, an existing network can be used without replacing its existing equipment or software.

Figures 12a and 12b are a "digital recording" player 102, such as an MP3 player, configured to fit around an ear. The "digital recording" player 102 has a speaker 18 which is configured to project audio sounds towards an individual's ear canal 30, when worn. The speaker 18 is fixably attached to a housing 20 which is configured to fit around and behind the ear 26. The housing 20 contains other components of the digital player circuitry. As

shown in Figure 12b, the player 102 may also have an elastic connector 35 to hold the player 102, when an individual is up-side-down.

The digital player circuitry is shown in Figure 13. A digital audio processor 104 is used to convert digital data from the RAM/ROM 106, such as through a serial cable, into a recreation of the recorded material. One possible format of the digital data is MP3. If a ROM 106 is used, it contains only a single digital recording. In an MP3 player, the ROM 106 would have stored in it a song or set of songs. The listener can only listen to the songs stored in the ROM. The "digital recording" player may have indicia of the "digital recording" on it. If the "digital recording" is a song, the indicia may be of the song's performing artist. If a RAM 106 is used, the uploading leads 108 are used to load the digital recording, such as an MP3 file, into the RAM 106. The uploading may be performed using a computer, or a computer with an internet connection.

The signal produced by the digital audio processor 104 is amplified by an audio amplifier 40. The amplified signal is sent to a speaker 96. The speaker 44 produces audio signals. To power the digital recording player, a power source 54, such as a battery, is used. The source is coupled to the digital audio processor 104 through a capacitor 52 and a switch 50, which may be used to turn the player on and off and control the volume.

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